EMCAL report to Temple

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Outline

- Intro – definition of “staged”
- Project flow
- Critical path and schedule
- Labor, cost profiles
- Installation
- CD-1 recommendations and responses
- Risk management

Intro

- 10,100 PWO crystals of $28 \times 28 \times 220$ mm^3
  - Tyvek wrapped
- PMT – 5-7 stages, gain 3000, requiring 7 HV's provided separately (no local voltage divider) daisy chaining 100 of them.
- Signal cable to FEB 2-4m
- Support structure has cells for individual crystals.
- Light pulser/optical fibers to test system and calibrate crystals.

Staged

- 1st stage has half as many crystals (~5000)
- Typical efficiency (compared to the full detector) is ~60%.
  - Near the beam pipe (not right next to it) there are more photons
- More crystals will be installed as long as their delivery is on schedule.

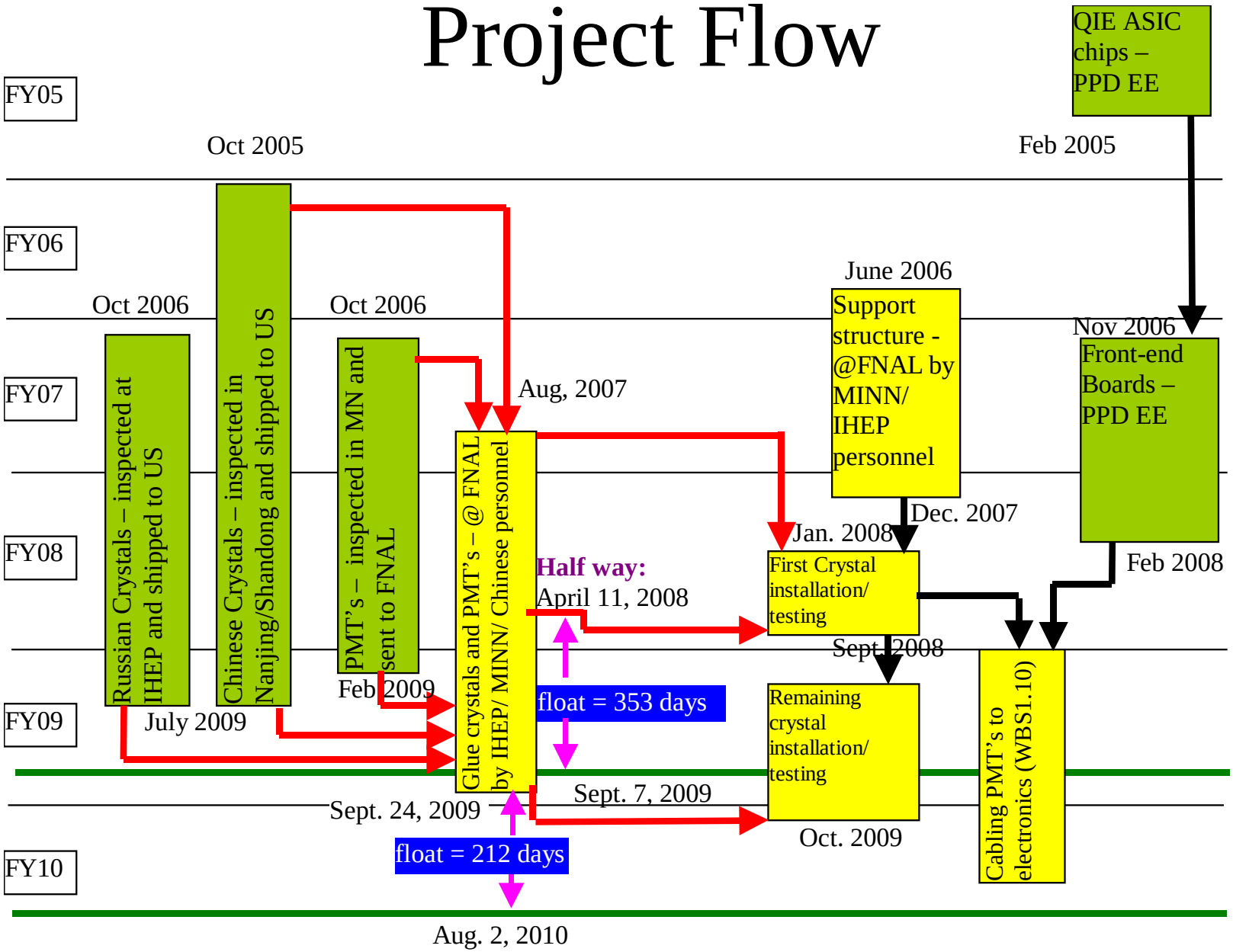


Fig. 1 Project Flow diagram and key dates

Critical Paths – Schedule floats

	Ready by	Need by	Floats
Support structure	Dec 27, 2007	Aug 27, 2008	168 days
20% of crystals-PMT's	Dec. 28, 2008	Dec 1, 2008	232 days
50% of crystals-PMT's	Apr. 11, 2008	Sept. 7, 2009	353 days
75% of crystals-PMT's	Nov. 28, 2008	July 1, 2010	397 days
100% of crystals-PMT's	Sep. 24, 2009	Aug. 2, 2010	212 days

Labor Profile

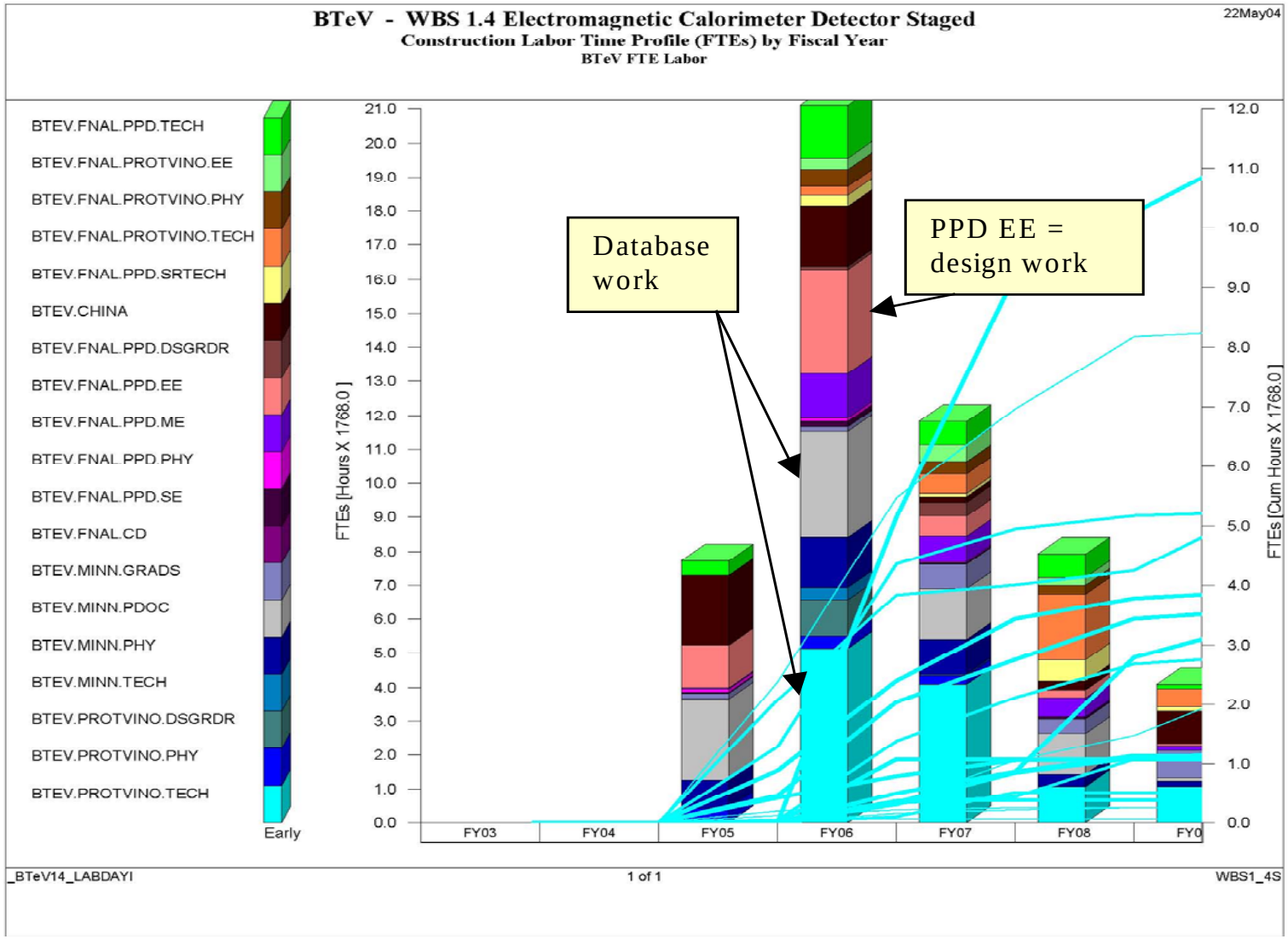
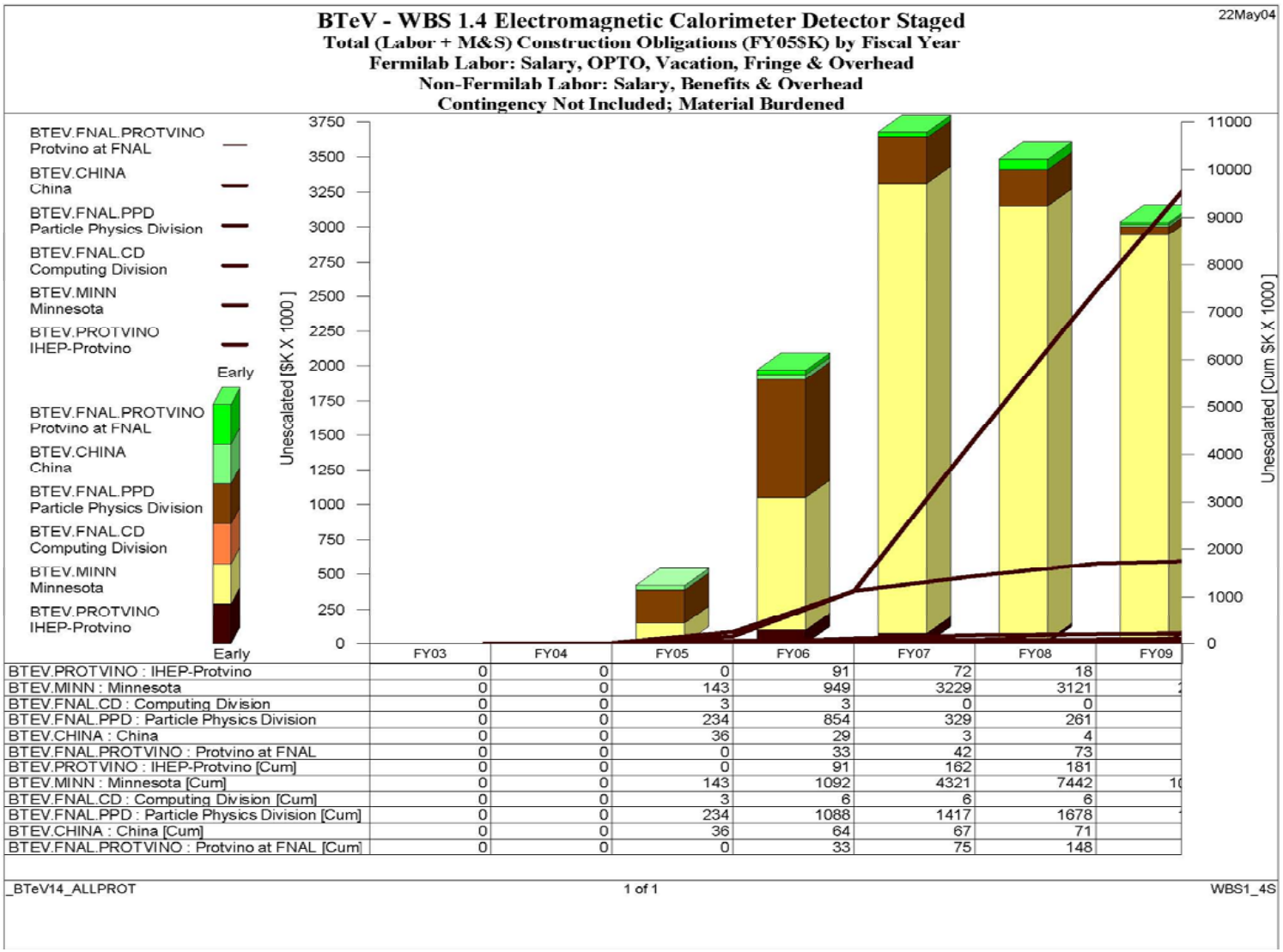


Fig. 2 Labor profile

Cost

- Total $12.5M base - $16.7M w/ contingency (33.6%)
- M&S $10M base
- Labor $2M
- $300k increase of CD-1 (Chinese crystal production accelerated)

Cost Profile



	FY03	FY04	FY05	FY06	FY07	FY08	FY09
BTEV.PROTVINO : IHEP-Protvino	0	0	0	91	72	18	
BTEV.MINN : Minnesota	0	0	143	949	3229	3121	
BTEV.FNAL.CD : Computing Division	0	0	3	3	0	0	
BTEV.FNAL.PPD : Particle Physics Division	0	0	234	854	329	261	
BTEV.CHINA : China	0	0	36	29	3	4	
BTEV.FNAL.PROTVINO : Protvino at FNAL	0	0	0	33	42	73	
BTEV.PROTVINO : IHEP-Protvino [Cum]	0	0	0	91	162	181	
BTEV.MINN : Minnesota [Cum]	0	0	143	1092	4321	7442	
BTEV.FNAL.CD : Computing Division [Cum]	0	0	3	6	6	6	
BTEV.FNAL.PPD : Particle Physics Division [Cum]	0	0	234	1088	1417	1678	
BTEV.CHINA : China [Cum]	0	0	36	64	67	71	
BTEV.FNAL.PROTVINO : Protvino at FNAL [Cum]	0	0	0	33	75	148	

Fig. 3 Cost Profile

Change from CD-1

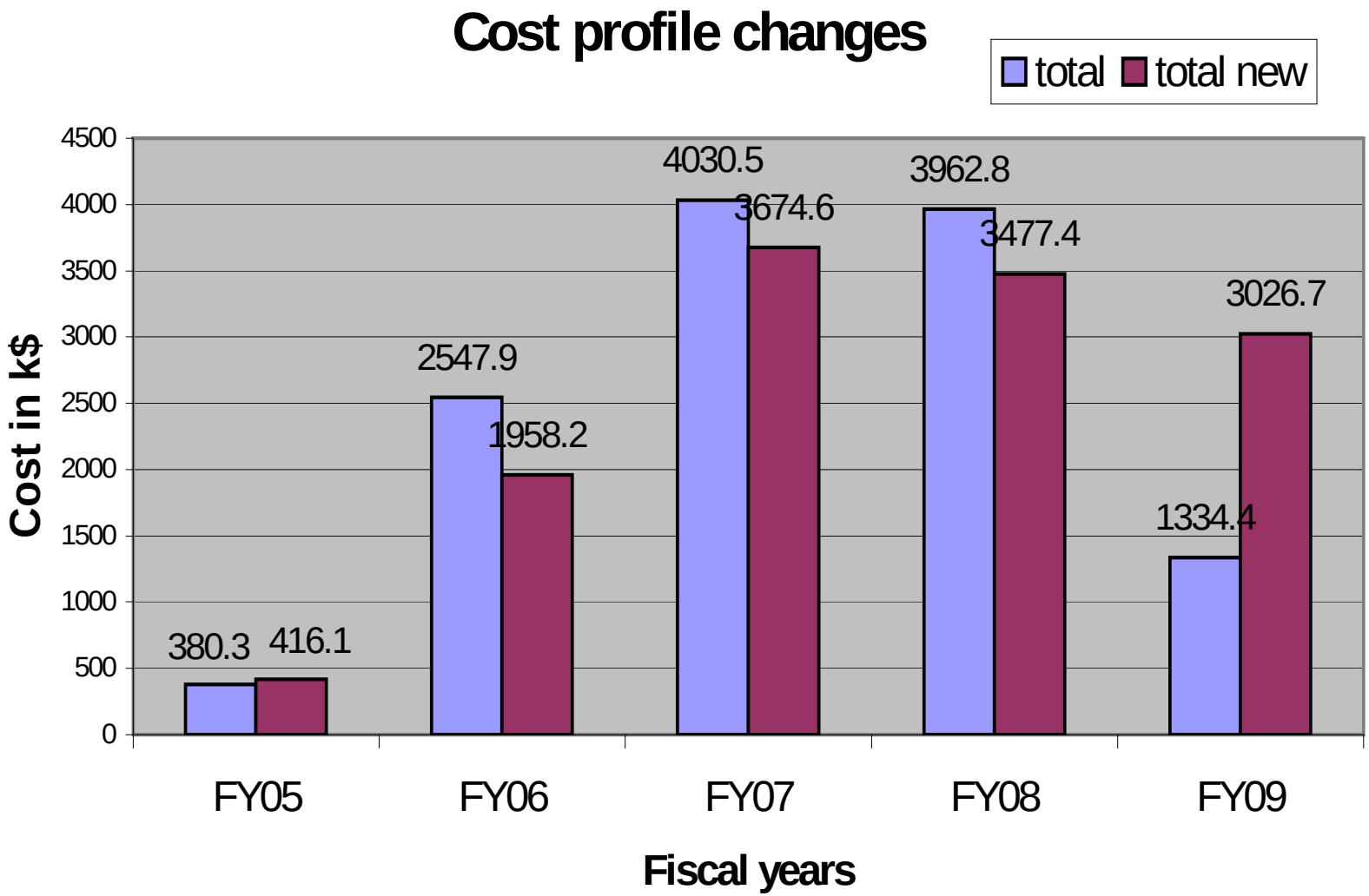


Fig. 5 Cost changes from CD-1

Obrowser view

Activity ID	Activity Name	Material($)	Labor($)	Base Cost($)	Material Contingency(%)	Labor Contingency(%)	Total FY05	Total FY06	Total FY07	Total FY08	Total FY09	Total FY05-09
1.4.1	Detector - PWO Crystals	6,093,310	93,752	6,187,062	40	30	55,146	384,831	1,153,295	2,933,106	0	4,526,378
1.4.2	Detectors - PMT's bases	2,149,969	141,332	2,291,301	28	24	2,525	203,353	1,337,638	1,358,152	0	2,901,668
1.4.3	EMCAL Electronics and Associated Infrastructure	1,510,739	639,067	2,149,806	30	30	387,907	469,960	1,925,088	10,111	0	2,793,065
1.4.4	Mech Air and Temperature ctrl Systems	402,561	600,452	1,003,013	20	24	0	654,561	227,616	291,286	0	1,173,463
1.4.5	Integration and Testing	114,542	460,324	574,866	26	32	4,376	662,986	76,653	8,933	0	752,946
1.4.6	EM Calorimeter Detector Subproject Management	67,975	191,024	258,999	38	25	43,353	77,248	73,697	107,282	0	301,581
1.4	**Subproject 1.4**	**10,339,095**	**2,125,951**	**12,465,046**	**35**	**28**	**493,307**	**2,452,939**	**4,793,987**	**4,708,869**	**0**	**12,449,101**

Installation in C0

i. move the support structure, with crystals partially loaded and tested, from the Assembly Hall to C0
ii. light pulsers and front-end electronics (FEB) near the detector
iii. Load crystals (PMT's attached)
iv. Connect optical fibers, signal cables and HV cables
v. Connect FEB's to DAQ
vi. Repeat (iii) and (iv) above in 2010. (v) too?

Installation labor

- 5.5 FTE
  - 4 FTE – physicists
  - 1 FTE – technicians
  - 0.5 FTE – engineers (ME & EE)

CD-1 recommendations

- Explore ways to arrive at a schedule with comfortable float (>6 months) by working with BTeV Management and Installation & Integration group.
  - Staged installation of EMCAL is our answer to this recommendation. We now have a minimum of 169 business days (> 6 months) of floats.
- Add an Installation Engineer to the project.
  - More engineering is being added as a shared resource to the Project Office.
- Add US collaborators
  - Yes, we are trying.

Default schedule

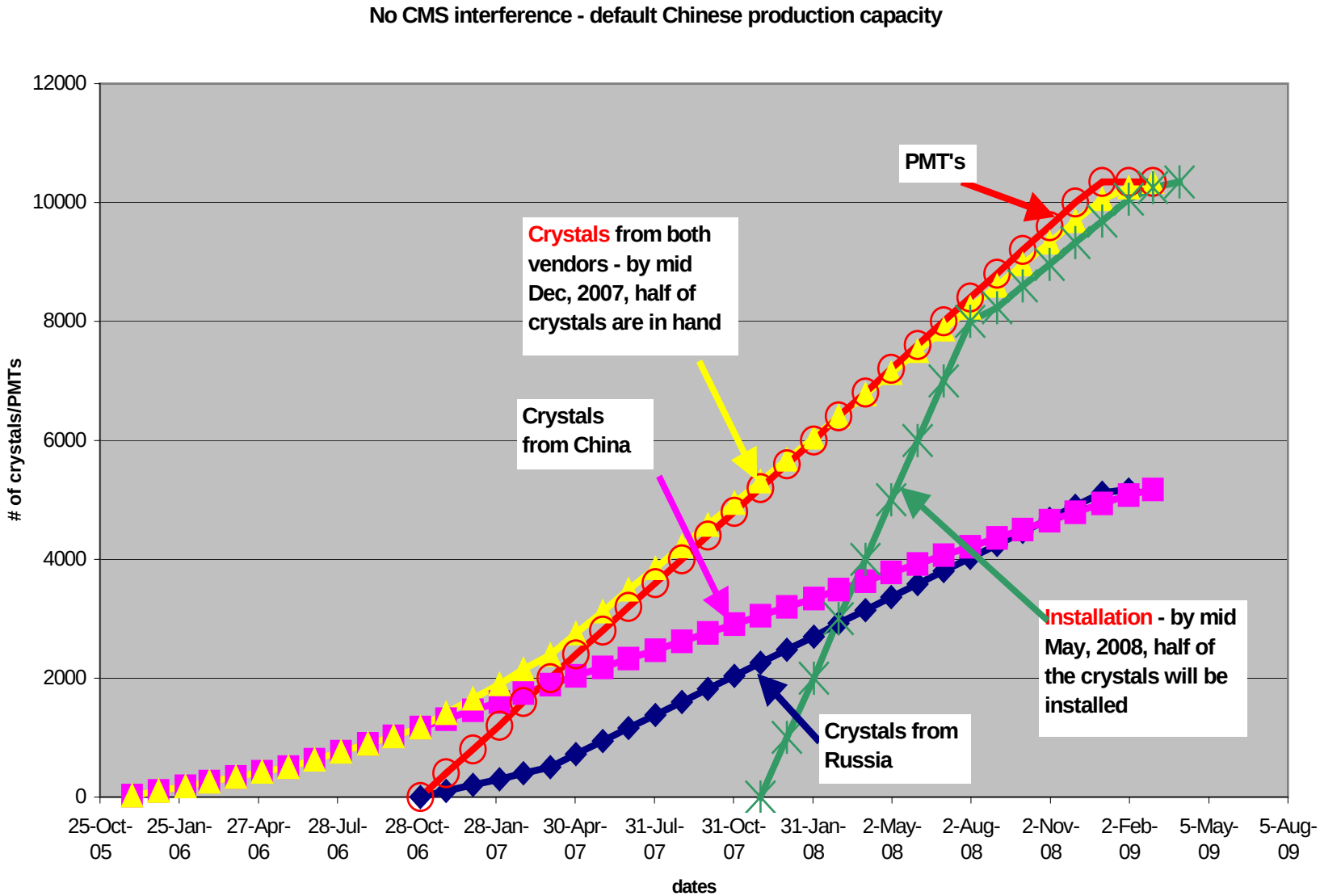


Fig. 4 Schedule of crystal and PMT acquisition and their installation

Risk - mitigation

- Acquisition of crystals with only a few manufacturers can be risky.
- CMS narrowed the vendor field to one fairly early in their process.
  - We will keep at least two vendors in the race.

If CMS is in our way

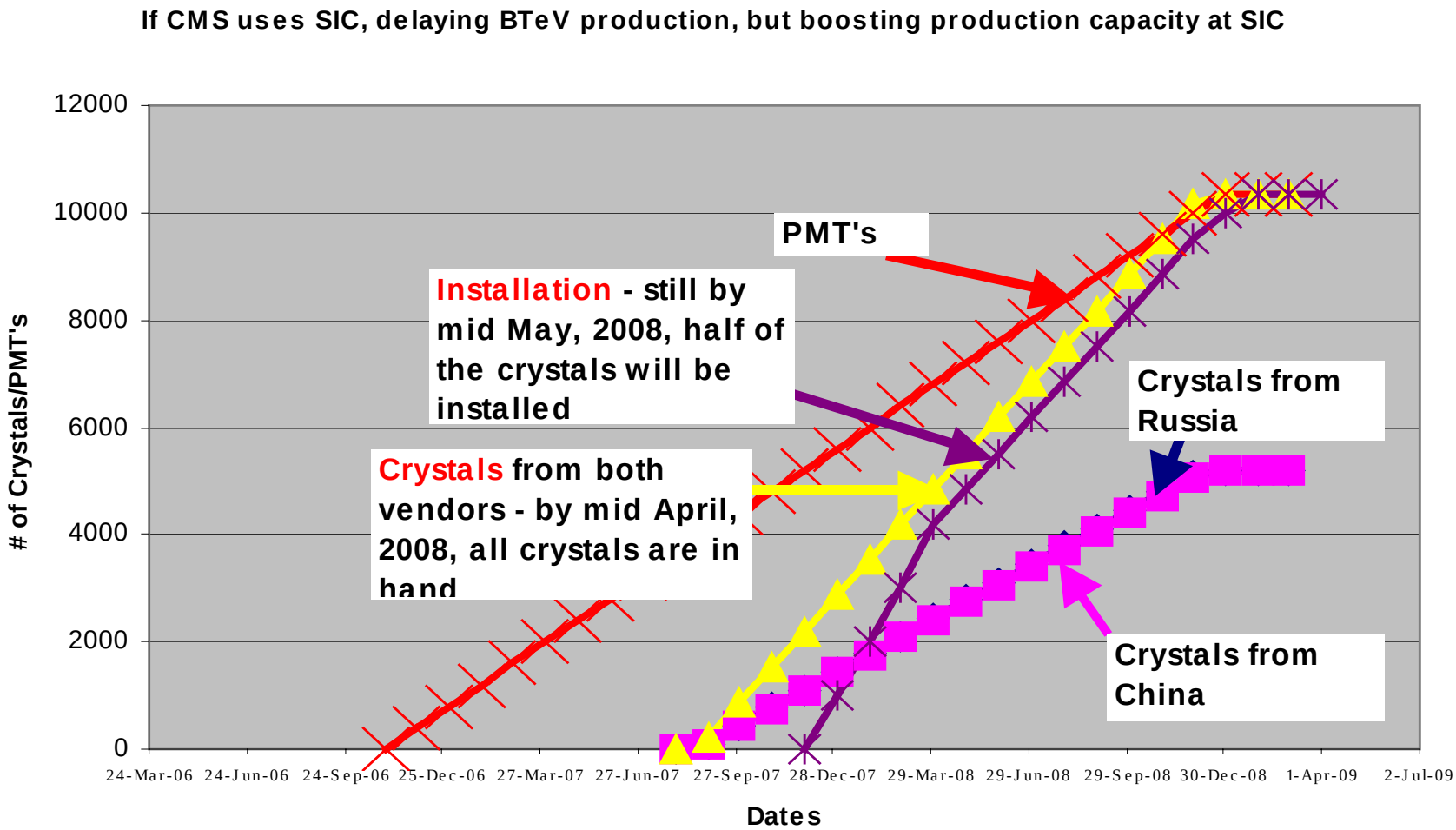


Fig. 6: alternative crystal production schedule in case vendors are busy with CMS crystal production until mid-2007.